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33031 7590 06/30/2008

CAMPBELL STEPHENSON LLP
11401 CENTURY OAKS TERRACE
BLDG. H, SUITE 250
AUSTIN, TX 78758

EXAMINER	
GANDHI, DIPAKKUMAR B	
ART UNIT	PAPER NUMBER
2117	

DATE MAILED: 06/30/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/822,950	03/30/2001	Andrew J. Thurston	CIS0069US	6592

TITLE OF INVENTION: BCH FORWARD ERROR CORRECTION DECODER

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$0	$0	$1440	09/30/2008

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/822,950	03/30/2001	Andrew J. Thurston	CIS0069US	6592

TITLE OF INVENTION: BCH FORWARD ERROR CORRECTION DECODER

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1440	$0	$0	$1440	09/30/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
GANDHI, DIPAKKUMAR B	2117	714-785000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☐ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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ART UNIT	PAPER NUMBER
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DATE MAILED: 06/30/2008

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 804 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 804 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability	Application No.	Applicant(s)	
	09/822,950	THURSTON, ANDREW J.	
	Examiner	Art Unit	
	DIPAKKUMAR GANDHI	2117	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *04/14/2008*.

2. ☒ The allowed claim(s) is/are *1-29, 31-55, which are renumbered as 1-54* .

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Jacques Louis-Jacques/, AU 2117, 5/22/08

Allowable Subject Matter

1. Claims 1-29, 31-55 are allowed.

2. Claim 30 is cancelled.

3. The terminal disclaimer filed on 04/14/2008 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of the full statutory term prior U.S. patent No. 7003,715 has been reviewed and is accepted. The terminal disclaimer has been recorded.

4. The following is an examiner's statement of reasons for allowance:

The present invention generally relates to data transmission systems, such as those used in computer and telecommunications networks, and particularly to fiber optic transmission systems for high-speed digital traffic, such as synchronous optical network (SONET) systems. More specifically, the present invention is directed to an improved method and apparatus for providing error correction in a SONET transmission system.

The claimed invention in claim 1 recites features such as:"…extracting an error polynomial from the data signal, wherein the extracting comprises generating a plurality of minimum-degree polynomials based on no more than six equations using no more than two branch decisions".

The prior art of record (Oh et al. US 5,583,499) teaches that in a decoding system which decodes a transmitted signal encoded by using a Reed-Solomon code, an error locator polynomial of the nth iteration is calculated based on a predetermined number of syndrome values; a group of variables of the (n-1)st iteration including a discrepancy and an error locator polynomial thereof; and an error locator polynomial of the (n-2)nd iteration (abstract, Oh et al.).

Kraft (US 5,343,481) teaches an error correction circuit wherein the coefficients of the error-location polynomial $\sigma(x)$ of any three-error correcting binary BCH code over the Galois Field GF(2^m) are found from the first three odd components S_1, S_3, and S_5 of the syndrome vector (abstract, Kraft).

Baggen (US 5,539,755) teaches extended error protected communication system. An extended consumer communication system uses a signal that is error protected by a block code. The generator polynomial is $G_n(x)=g_0(x)\ldots g_n(x)$ which is factorizable, and each of the factors implements a linear and

systematic code. Generally, each of the factors adds redundancy and raises the level of error protection (abstract, Baggen).

Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall Inc., page 204) teaches t-error-correcting BCH code. Wicker also teaches that $\{X_i\}$ are error locators, for their values indicate the positions of the errors in the received word. We obtain a sequence of 2t algebraic syndrome equations in the v unknown error locations, S_1, S_2, S_3, S_4, ... S_{2t} (page 204, Wicker).

Erhart et al. (US 5,051,999) teaches a paging receiver receiving message information having one of a plurality of (BCH) code word structures has a programmable error correcting apparatus for correcting bit errors within the message information (abstract, Erhart et al.).

Stenerson (US 4,597,083) teaches that an error detection and correction system locates and corrects double errors in a received data block word digitally encoded in a Reed-Solomon code (n,K) as coefficient terms of an n-order codeword polynomial (abstract, Stenerson).

Alvarez et al. (US 2002/0165962 A1) teach a Line Card Manager (LCM) architecture for use at an optical switch in an optical communications network. A LCM with a dedicated processor is provided for different line cards at the switch (abstract, Alvarez et al.).

Wolf (US 6,385,751 B1) teaches that a programmable, reconfigurable Reed-Solomon encoder/decoder allows for flexible reprogramming of encoders and decoders for a variety of applications (abstract, Wolf).

Maki et al. (US 4,873,688) teach that a Galois Field error correction decoder is described which can correct an error in a received polynomial. The apparatus includes means for generating a plurality of syndrome polynomials. A magnitude polynomial and a location polynomial having a first derivative are calculated from the syndrome polynomials utilizing Euclid's Algorithm (abstract, Maki et al.).

Shen et al. (US 6,199,188 B1) teach that a system determines the locations of four errors in a code word over GF(2^m), for any m, by transforming a degree-four error locator polynomial $\sigma(x)$ ultimately into two quadratic equations, finding the solutions of these equations, and from these solutions determining the roots of the error locator polynomial (abstract, Shen et al.).

The prior arts however do not teach extracting an error polynomial from the data signal, wherein the extracting comprises generating a plurality of minimum-degree polynomials based on no more than six equations using no more than two branch decisions.

Hence, the prior arts of record do not anticipate nor render obvious the claimed invention. Thus, claim 1 is allowable over the prior arts of record. Claims 2-12, 55 are allowed because of the combination of additional limitations and the limitations listed above.

- The claimed invention in claim 13 recites features such as:"… feeding the syndromes to a plurality of Galois field multiply accumulators; calculating a plurality of minimum-degree polynomials associated with the BCH code, using the Galois field multiply accumulators."

The prior art of record (Oh et al. US 5,583,499) teaches that in a decoding system which decodes a transmitted signal encoded by using a Reed-Solomon code, an error locator polynomial of the nth iteration is calculated based on a predetermined number of syndrome values; a group of variables of the (n-1)st iteration including a discrepancy and an error locator polynomial thereof; and an error locator polynomial of the (n-2)nd iteration (abstract, Oh et al.).

Kraft (US 5,343,481) teaches an error correction circuit wherein the coefficients of the error-location polynomial $\sigma(x)$ of any three-error correcting binary BCH code over the Galois Field GF(2^m) are found from the first three odd components S_1, S_3, and S_5 of the syndrome vector (abstract, Kraft).

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Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall Inc., page 204) teaches t-error-correcting BCH code. Wicker also teaches that $\{X_i\}$ are error locators, for their values indicate the positions of the errors in the received word. We obtain a sequence of 2t algebraic syndrome equations in the v unknown error locations, S_1, S_2, S_3, S_4, ... S_{2t} (page 204, Wicker).

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Wolf (US 6,385,751 B1) teaches that a programmable, reconfigurable Reed-Solomon encoder/decoder allows for flexible reprogramming of encoders and decoders for a variety of applications (abstract, Wolf).

Maki et al. (US 4,873,688) teach that a Galois Field error correction decoder is described which can correct an error in a received polynomial. The apparatus includes means for generating a plurality of syndrome polynomials. A magnitude polynomial and a location polynomial having a first derivative are calculated from the syndrome polynomials utilizing Euclid's Algorithm (abstract, Maki et al.).

Shen et al. (US 6,199,188 B1) teach that a system determines the locations of four errors in a code word over GF(2^m), for any m, by transforming a degree-four error locator polynomial $\sigma(x)$ ultimately into two quadratic equations, finding the solutions of these equations, and from these solutions determining the roots of the error locator polynomial (abstract, Shen et al.).

The prior arts however do not teach feeding the syndromes to a plurality of Galois field multiply accumulators; calculating a plurality of minimum-degree polynomials associated with the BCH code, using the Galois field multiply accumulators.

Hence, the prior arts of record do not anticipate nor render obvious the claimed invention. Thus, claim 13 is allowable over the prior arts of record. Claims 14-24 are allowed because of the combination of additional limitations and the limitations listed above.

- Claim 25 recites similar features as in claim 1. Thus claim 25 is allowable over the prior arts of record. Claims 26-29, 31-37 are allowed because of the combination of additional limitations and the limitations listed above.
- The claimed invention in claim 38 recites features such as:"…a state machine programmed to use the Galois field multiply accumulators to generate an error polynomial based on the following six equations:

(1) $d_0 = S_1$,

(2) $d_1 = S_3 + S_1S_2$,

(3) $\sigma^1(X) = 1 + S_1X$,

(4) if ($d_1 = 0$) then $\sigma^2(X) = \sigma^1(X)$

else if ($d_0 = 0$) then $\sigma^2(X) = q_0\sigma^1(X) + d_1X^3$

else $\sigma^2(X) = q_0\sigma^1(X) + d_1X^2$,

(5) $d_2 = S_5\sigma 0 + S_4\sigma 1 + S_3\sigma 2 + S_2\sigma 3$, and

(6) if ($d_2 = 0$) then $\sigma^3(X) = \sigma^2(X)$

else $\sigma^3(X) = q_1\sigma^1(X) + d_1X^3$,

where S_i are error syndromes, σ^j are minimum-degree polynomials, σ_1 are four coefficients for $\sigma^2(X)$, d_0-d_2 are correction factors, q_0-q_1 are additional correction factors, q_0 is equal to d_0 unless d_0 is zero, when q_0 is 1, and q_1 is equal to d_1 unless d_1 is zero, when $q_1 = q_0$."

The prior art of record (Oh et al. US 5,583,499) teaches that in a decoding system which decodes a transmitted signal encoded by using a Reed-Solomon code, an error locator polynomial of the nth iteration is calculated based on a predetermined number of syndrome values; a group of variables of the (n-1)st iteration including a discrepancy and an error locator polynomial thereof; and an error locator polynomial of the (n-2)nd iteration (abstract, Oh et al.).

Kraft (US 5,343,481) teaches an error correction circuit wherein the coefficients of the error-location

polynomial $\sigma(x)$ of any three-error correcting binary BCH code over the Galois Field GF(2^m) are found from the first three odd components S_1, S_3, and S_5 of the syndrome vector (abstract, Kraft).

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Erhart et al. (US 5,051,999) teaches a paging receiver receiving message information having one of a plurality of (BCH) code word structures has a programmable error correcting apparatus for correcting bit errors within the message information (abstract, Erhart et al.).

Stenerson (US 4,597,083) teaches that an error detection and correction system locates and corrects double errors in a received data block word digitally encoded in a Reed-Solomon code (n,K) as coefficient terms of an n-order codeword polynomial (abstract, Stenerson).

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Shen et al. (US 6,199,188 B1) teach that a system determines the locations of four errors in a code word over GF(2^m), for any m, by transforming a degree-four error locator polynomial $\sigma(x)$ ultimately into two quadratic equations, finding the solutions of these equations, and from these solutions determining the roots of the error locator polynomial (abstract, Shen et al.).

The prior arts however do not teach a state machine programmed to use the Galois field multiply accumulators to generate an error polynomial based on the following six equations:

(1) $d_0 = S_1$,

(2) $d_1 = S_3 + S_1S_2$,

(3) $\sigma^1(X) = 1 + S_1X$,

(4) if ($d_1 = 0$) then $\sigma^2(X) = \sigma^1(X)$

else if ($d_0 = 0$) then $\sigma^2(X) = q_0\sigma^1(X) + d_1X^3$

else $\sigma^2(X) = q_0\sigma^1(X) + d_1X^2$,

(5) $d_2 = S_5\sigma 0 + S_4\sigma 1 + S_3\sigma 2 + S_2\sigma 3$, and

(6) if ($d_2 = 0$) then $\sigma^3(X) = \sigma^2(X)$

else $\sigma^3(X) = q_1\sigma^1(X) + d_1X^3$,

where S_i are error syndromes, σ^j are minimum-degree polynomials, σ_1 are four coefficients for $\sigma^2(X)$, d_0-d_2 are correction factors, q_0-q_1 are additional correction factors, q_0 is equal to d_0 unless d_0 is zero, when q_0 is 1, and q_1 is equal to d_1 unless d_1 is zero, when $q_1 = q_0$.

Hence, the prior arts of record do not anticipate nor render obvious the claimed invention. Thus, claim 38 is allowable over the prior arts of record. Claims 39-47 are allowed because of the combination of additional limitations and the limitations listed above.

- The claimed invention in claim 48 recites features such as:"… wherein said decoding means uses a non- iterative algorithm to generate the error polynomial based on a plurality of minimum-degree polynomials."

The prior art of record (Oh et al. US 5,583,499) teaches that in a decoding system which decodes a transmitted signal encoded by using a Reed-Solomon code, an error locator polynomial of the nth iteration is calculated based on a predetermined number of syndrome values; a group of variables of the (n-1)st iteration including a discrepancy and an error locator polynomial thereof; and an error locator polynomial of the (n-2)nd iteration (abstract, Oh et al.).

Kraft (US 5,343,481) teaches an error correction circuit wherein the coefficients of the error-location polynomial $\sigma(x)$ of any three-error correcting binary BCH code over the Galois Field GF(2^m) are found from the first three odd components S_1, S_3, and S_5 of the syndrome vector (abstract, Kraft).

Baggen (US 5,539,755) teaches extended error protected communication system. An extended consumer communication system uses a signal that is error protected by a block code. The generator polynomial is $G_n(x)=g_0(x)\ldots g_n(x)$ which is factorizable, and each of the factors implement a linear and systematic code. Generally, each of the factors adds redundancy and raises the level of error protection (abstract, Baggen).

Wicker (Error Control Systems for Digital Communication and Storage, 1995, Prentice-Hall Inc., page 204) teaches t-error-correcting BCH code. Wicker also teaches that $\{X_i\}$ are error locators, for their values indicate the positions of the errors in the received word. We obtain a sequence of 2t algebraic syndrome equations in the v unknown error locations, S_1, S_2, S_3, S_4, ... S_{2t} (page 204, Wicker).

Erhart et al. (US 5,051,999) teaches a paging receiver receiving message information having one of a plurality of (BCH) code word structures has a programmable error correcting apparatus for correcting bit errors within the message information (abstract, Erhart et al.).

Stenerson (US 4,597,083) teaches that an error detection and correction system locates and corrects double errors in a received data block word digitally encoded in a Reed-Solomon code (n,K) as coefficient terms of an n-order codeword polynomial (abstract, Stenerson).

Alvarez et al. (US 2002/0165962 A1) teach a Line Card Manager (LCM) architecture for use at an optical switch in an optical communications network. A LCM with a dedicated processor is provided for different line cards at the switch (abstract, Alvarez et al.).

Wolf (US 6,385,751 B1) teaches that a programmable, reconfigurable Reed-Solomon encoder/decoder allows for flexible reprogramming of encoders and decoders for a variety of applications (abstract, Wolf).
Maki et al. (US 4,873,688) teach that a Galois Field error correction decoder is described which can correct an error in a received polynomial. The apparatus includes means for generating a plurality of syndrome polynomials. A magnitude polynomial and a location polynomial having a first derivative are calculated from the syndrome polynomials utilizing Euclid's Algorithm (abstract, Maki et al.).
Shen et al. (US 6,199,188 B1) teach that a system determines the locations of four errors in a code word over GF(2^m), for any m, by transforming a degree-four error locator polynomial $\sigma(x)$ ultimately into two quadratic equations, finding the solutions of these equations, and from these solutions determining the roots of the error locator polynomial (abstract, Shen et al.).
The prior arts however do not teach that the decoding means uses a non- iterative algorithm to generate the error polynomial based on a plurality of minimum-degree polynomials.
Hence, the prior arts of record do not anticipate nor render obvious the claimed invention. Thus, claim 48 is allowable over the prior arts of record. Claims 49-54 are allowed because of the combination of additional limitations and the limitations listed above.

- Thus, claims 1-29, 31-55 are allowable over the prior arts of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DIPAKKUMAR GANDHI whose telephone number is (571)272-3822. The examiner can normally be reached on 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacques Louis-Jacques can be reached on (571) 272-6962. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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